

Greenhouse Gas Emissions and Lower-Carbon Fuels

December 1, 2004

California Environmental Protection Agency



Air Resources Board

Agenda

- ✦ **Background**
- ✦ **Summary of Board action on regulations to control greenhouse gas emissions (GHG) from motor vehicles.**
 - AB 1493
 - Board action on Sep 24. 2004
- ✦ **Potential use of bio fuels in CA**
 - Ethanol
 - Blends (E6, E10)
 - E85
 - Biodiesel
 - Others
- ✦ **Approaches to encourage the use of low carbon fuels in CA**
 - Regulatory
 - Incentives



Background

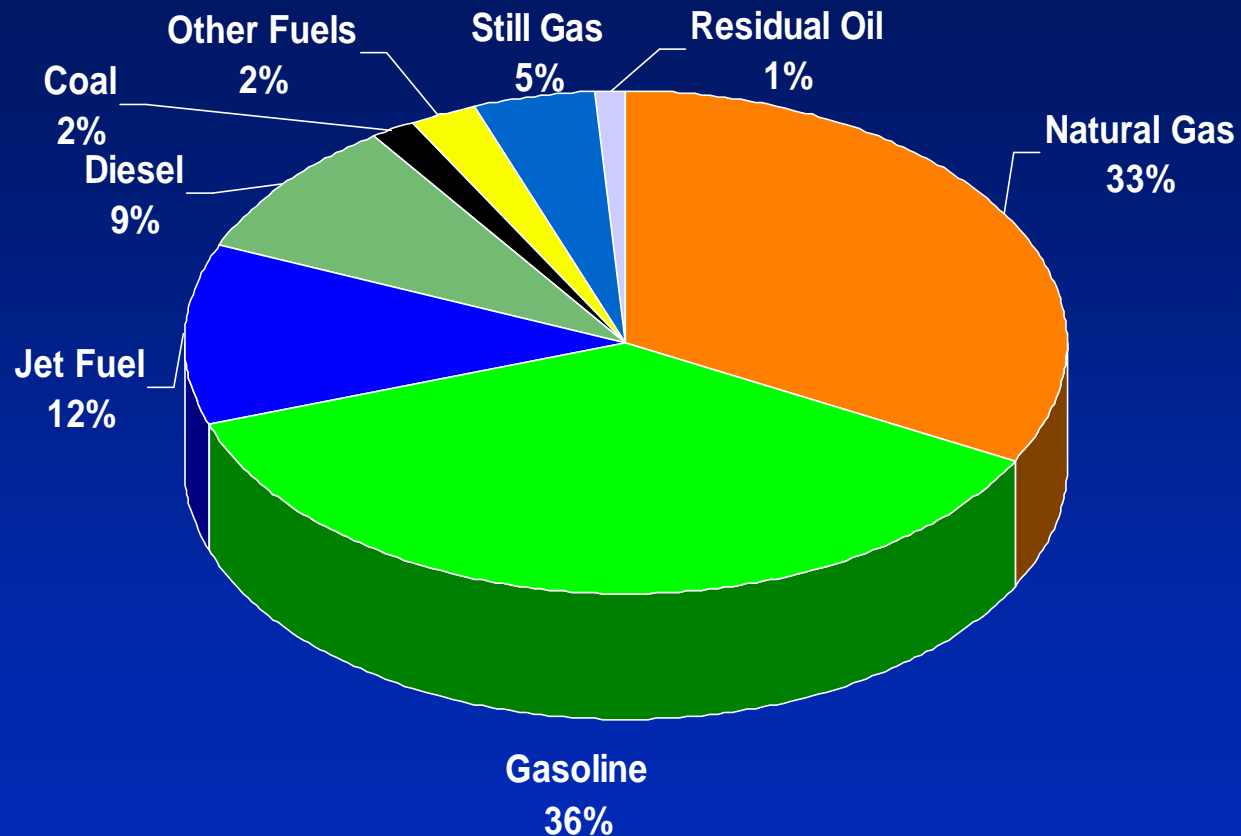
Need for GHG Emissions Reductions

- ✦ Climate change indicators in California (snow melting in Sierra, water runoff decrease, sea level rise, heat wave frequency increase...)
- ✦ Total GHG increase since 1990 by about 5.5%
- ✦ Air temperature increase by 2-10° F predicted in 100 years.
- ✦ 31% GHG and 58% CO₂ produced in CA come from transportation sector in 1999

California Motor Vehicle Regulations

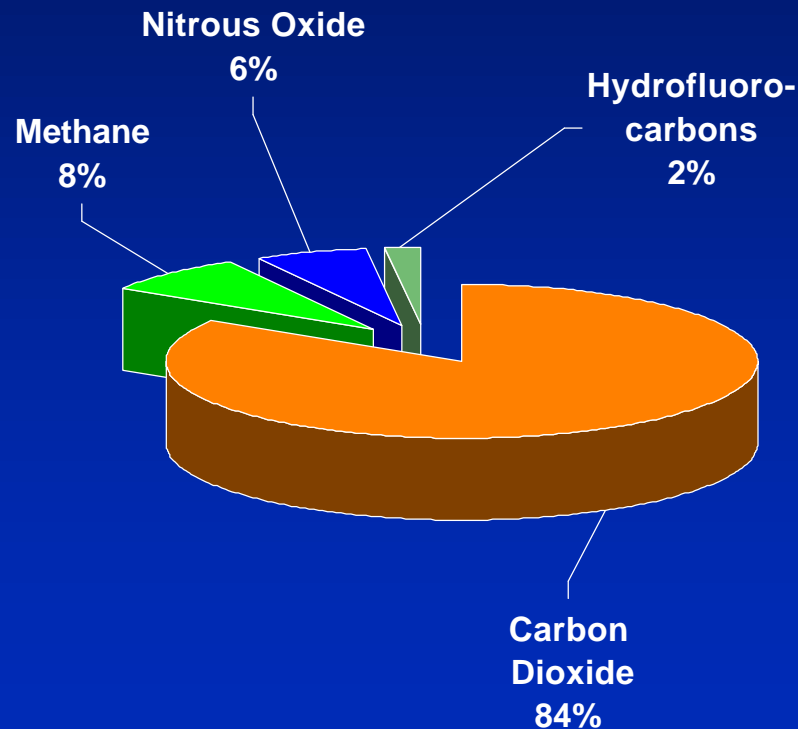
- ✦ Longstanding California programs to control motor vehicle emission
- ✦ Low Emission Vehicle Program (LEV II) highly successful in controlling smog-forming emissions.
- ✦ Now being expanded to include regulation of greenhouse gases

CO₂ Emissions by Fossil Fuel Type 1999



Source: Greenhouse Gas Inventory , CA Energy Commission 2001

1999 California Greenhouse Gas Emissions



Sources:

- ✦ Carbon Dioxide (CO₂): Fossil fuel combustion
- ✦ Methane: Fossil Fuels, Landfills, agriculture
- ✦ Nitrous Oxide: Agriculture, cars
- ✦ Hydrofluorocarbons: Refrigerants, solvents

Source: Greenhouse Gas Inventory Update, California Energy Commission, 2001



Summary Board Actions on September 24, 2004

Assembly Bill 1493

Requirements

- ✦ Adopt regulations by January 1, 2005: achieve the maximum feasible and cost-effective reduction of GHG emissions from motor vehicles.
- ✦ Consider economic impacts, including impacts on jobs, businesses, and California business competitiveness with other states.
- ✦ Provide automobile manufacturers maximum flexibility.
- ✦ Allow opportunity for legislative oversight.

Regulations Must Provide ...

- ✦ **Maximum flexibility**
- ✦ **Credit for early automaker action**
- ✦ **Alternative means of Compliance**
- ✦ **“Economical to an owner of a vehicle, taking into account the full life-cycle costs of a vehicle” (AB 1493)**

Board Action on September 24, 2004

- ✦ Approved regulation that requires automakers to begin selling vehicles with reduced greenhouse gases by model year 2009.
- ✦ The regulation includes near-term standards, phased in from 2009 through 2012, and mid-term standards, phased in from 2013 through 2016.
- ✦ Credit for the use of fuels that produce lower GHG emissions in vehicles covered in the program.

Benefits and Impacts

- ✦ Emissions: reduce GHG from the light duty fleet by
 - 18% in 2020
 - 27% in 2030
- ✦ Compliance cost: average vehicle price increases by
 - \$200-\$300 in model year 2012
 - \$1000-\$1050 in 2016.
- ✦ Net savings to average consumer of \$3 to \$7 per month for most stringent (2016) standards.
- ✦ Lifetime ownership cost of owning vehicles reduced by
 - \$1,916 in 2012 to \$1,882 in 2016



Potential Use of Bio fuels in California to Reduce GHG

Definition of Lower-Carbon Fuel

“Fuels that result in reduction in Carbon Emissions when consider life cycle emissions.”

Current Use of lower-carbon fuels in CA

✦ Gasoline:

- 95%+ CaRFG3 with 5.7% vol. ethanol or about 900 millions gal per year in 2004.

✦ Diesel:

- Biodiesel: 18.5 mil gallons B100 sold in 2003 (0.7% total diesel consumption)

Current Capacity of Producing lower-carbon fuels in CA

✦ Gasoline:

- Ethanol: < 10 millions gal/yr

✦ Diesel:

- Biodiesel: 7 - 8.5 millions gallons/year currently,
up to 40 millions gallons/year in 2 years

Tax Credits

✦ Ethanol Gasoline

- Federal tax subsidy: For E6: 3 c/gal
- For E10: 5.2 c/gal

✦ Biodiesel

Recently enacted legislation:

- 1 cent per percent of blended agriculture-product biodiesel (i.e., 20 c/gal for B20).
- 0.5 cent per percent of blended recycled-oil biodiesel (i.e., 10 c/gal for B20).

Ethanol Gasoline

✦ Benefits:

- Emissions: going from 5.7% to 10% corn-based ethanol gasoline, about 1.2% GHG reduction.
- Adequate supply from Mid-west.
- Cellulosic ethanol would help solve CA waste disposal issue.
- GHG Reductions per Vehicle Mile, for using E10*:
 - Corn-ethanol: 2%
 - Cellulosic ethanol: 6-9%

*Argonne National Laboratory, 1999

E6 and E10

- ✦ 95% of gasoline in CA uses E5.7
- ✦ Potential use of E10 would increase Ethanol consumption from 900 million gallons to 1,600 million gallons*

* Based on 2004 gasoline consumption.

E85

- ✦ Currently about 250,000 E85 vehicles in CA.
- ✦ Could consume up to 200 million gallons per year of E85
- ✦ 3 fueling stations (1 for public, 2 for fleet use)
- ✦ Would avoid emissions impacts associated with E5.7 and E10.
- ✦ Would need economic incentives.

Ethanol Issues

- Increase emission from permeation
- Energy content of E10 smaller than E5.7 results 1.5% gasoline more needed---> higher fuels costs.
- Inadequate ethanol supply in the state.
- Poor cost-effectiveness: \$700/ton for CO₂ reductions


Biodiesel

✦ Emissions:

- 78% CO₂ reduction based on life-cycle (Well-to-Wheel).
- 47% PM reduction.

✦ Issues:

- 13-25 c/gal diesel price increases for B20
- higher NO_x emissions.
- imported soybean biodiesel and inadequate supply of yellow grease for biodiesel feedstock.
- limited acceptance from automobile companies and engine manufacturers.



Potential Approaches to Encourage the Use of Lower- Carbon Fuels in California

Potential Approaches

- ✦ Traditional Regulatory Approach.
- ✦ “Trading Market” Regulatory System.
- ✦ Financial Incentives and/or Disincentives.

Traditional Regulation

- ✦ Set Carbon content or other Measure of GHG Potential for each fuel.
- ✦ Allow for Limited Averaging and Trading.
- ✦ Apply on Fuel by Fuel Basis.

Trading Market Regulatory Approach

- ✦ Set Overall Performance Standard for Vehicle Fuels.
- ✦ Establish where Credit Generation.
- ✦ Establish Market where Credits could be bought, sold and traded.

Incentive/Disincentive Approach

- ✦ Develop Goals for Program.
- ✦ Establish System of Incentives to make preferred Financial Attractive.
- ✦ Adjust over time to Achieve Desired Results.

Issues with All Approaches

- ✦ Limited Effect because must work in Existing Fleet.
- ✦ Cost Effectiveness.
- ✦ Impact on Emissions of Ozone and PM Precursors.
- ✦ Novelty and Complexities of Approaches.
- ✦ Adequacy of Current Legal Authorities.

Discussion